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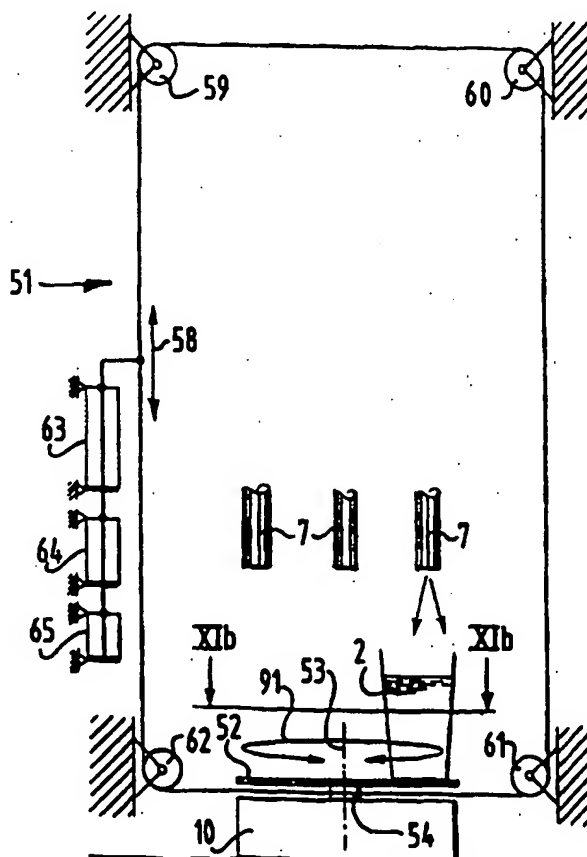


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(21) International Application Number: PCT/NL98/00497 (22) International Filing Date: 1 September 1998 (01.09.98) (30) Priority Data: 1006911 2 September 1997 (02.09.97) NL (71) Applicant (for all designated States except US): GERRITSE BEHEER B.V. [NL/NL]; Mercuriusweg 19, NL-6971 GV Brummen (NL). (72) Inventor; and (75) Inventor/Applicant (for US only): GERRITSE, Jan [NL/NL]; Engelenburgerlaan 27, NL-6971 BV Brummen (NL). (74) Agent: SCHUMANN, Bernard, Herman, Johan; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Dutch).</i>

(54) Title: APPARATUS FOR METERING A PLURALITY OF DIFFERENT LIQUID OR PASTY MATERIALS**(57) Abstract**

An apparatus for metering a plurality of different liquid or pasty masses to a receiving container, which apparatus comprises: first supporting means for supporting containers for the masses in fixed positions; a fixedly disposed annular frame bearing a number of dispensing nozzles controllable by fixedly disposed control means and each individually connectable to said containers via respective conduits; second supporting means controllable by the control means for supporting a receiving container such that this receiving container is displaceable in an annular path corresponding with the annular form of the frame and can be placed temporarily beneath a chosen dispensing nozzle for receiving mass dispensed by this dispensing nozzle; a weighing device on which a receiving container can be placed, which weighing device can supply weight signals to the control means; wherein the weighing device is disposed fixedly, is connected to the control means via cable means and supports the second supporting means, and wherein the second supporting means are rotatably drivable round a vertical axis by means of a drive device co-acting with the second supporting means such that when a weighing is performed the drive is inactive such that no forces which can influence the weighing are exerted on these second supporting means, for instance the drive is substantially disengaged from the second supporting means.



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APPARATUS FOR METERING A PLURALITY OF DIFFERENT LIQUID OR PASTY MATERIALS

The invention relates to an apparatus for metering a plurality of different liquid or pasty masses. Such an apparatus is known in diverse embodiments and is also designated as colour kitchen. Said masses are in that case paint, ink, thickening or thinning agents and the like. The masses have to be supplied in predetermined quantities, at least mutual ratios, to a receiving container. This receiving container, for instance a bucket, a can or the like, must be filled with a determined quantity of mixture. For this purpose predetermined quantities of selected masses are admitted successively into the receiving container. As soon as the receiving container is filled with all desired components in the desired quantities, a subsequent receiving container is filled in comparable manner with the constituent components. In this subsequent and other cycles, the composition can differ in accordance with the composition of the finally required mixture.

After the constituent components have been placed in the receiving container, homogenization generally takes place by means of known homogenizing processes, in particular stirring and shaking.

An apparatus of said type comprises provisions for supporting containers for the masses for metering. These containers can be connected by means of flexible hoses or fixed conduits to dispensing nozzles for individual dosing in each case of a determined quantity of a relevant mass. A placed receiving container and all relevant dispensing nozzles must be mutually movable such that each dispensing nozzle can dispense mass to the receiving container. It is known for instances to fixedly dispose a container on scales and to place the relevant dispensing nozzle in each case above the receiving container by means of a movable frame.

Alternatively, a frame supporting the dispensing nozzles can be fixedly disposed, wherein the scales supporting the receiving container are movable thereunder.

5 The scales are of importance for dispensing a determined mass in the correct quantity. The control of the dispensing nozzles therefore takes place on the basis of this mass measurement. It is possible in principle to suffice with a mass or weight difference measurement.

10 In the case where the dispensing nozzles are movable relative to the storage container, use must be made of flexible conduits. The great drawback of flexible conduits is that they are subject to undesirable mechanical loads, in particular torsion, which can greatly reduce
15 the lifespan and can cause malfunctions. Hoses are further subject to ageing. This is the reason why an embodiment is usually recommended with a fixed spatial relation between the dispensing nozzles and the storage containers, in which case fixed conduits of for instance plastic
20 or metal can be used. In that case the scales with a receiving container thereon must be arranged displaceably relative to the nozzles. Such an arrangement does however have the drawback that the conduits connecting the electronically operating weighing device to central, fixedly
25 disposed control means are likewise subjected to mechanical influences.

 This mechanical influence can remain limited by making use of a horizontal linear X or XY mobility within limited boundaries. Such an arrangement has the drawback
30 however that it takes a relatively large amount of time to go from one side of an array to the other, which may nevertheless occur during operation of the apparatus. Recommended in this respect is an annular arrangement of the dispensing nozzles and a corresponding annular path
35 in which the weighing device with a receiving container thereon can move.

 If desired, there may even be a movement predominantly in one direction along such a path. This is not possible however without specific measures, since the
40 conduits providing the necessary supply of electrical

energy to the weighing device and the information cables are otherwise placed under torsional stress.

It is an object of the invention to provide an apparatus which obviates all drawbacks of said techniques and is not afflicted with the limitations of the known art.

In respect of the above, the invention provides an apparatus for metering a plurality of different liquid or pasty masses such as paint, ink, thickening or thinning agents and the like to a receiving container, for instance a bucket or a can, which apparatus comprises:

first supporting means for supporting containers for the masses in fixed positions;

a fixedly disposed annular frame bearing a number of dispensing nozzles controllable by fixedly disposed central control means (PLC, PC) and each individually connectable to said containers via respective conduits;

second supporting means controllable by said control means for supporting a receiving container such that this receiving container is displaceable in an annular path corresponding with the annular form of the frame and can be placed temporarily beneath a chosen dispensing nozzle for receiving mass dispensed by this dispensing nozzle;

a weighing device on which a receiving container can be placed, which weighing device can supply signals to the control means which are representative for the weight of the receiving container with its content or the change in that weight;

which control means are adjustable, for instance by means of program control, for dispensing different masses in determined quantities to successive receiving containers, for instance in successive cycles, in order to make successive mixtures of respective chosen compositions;

wherein the weighing device is disposed fixedly, is connected to the control means via cable means and supports the second supporting means, and

wherein the second supporting means are rotatably drivable round a vertical axis by means of a drive device co-acting with the second supporting means such that when a weighing is performed the drive is inactive such that

no forces which can influence the weighing are exerted on these second supporting means, for instance the drive is substantially disengaged from the second supporting means.

5 Attention is drawn in this respect to the fact that an apparatus is known from applicant's earlier non-pre-published Netherlands patent application NL-1006685 of 30 July 1997 wherein the weighing device is supported by the second supporting means. Since the weighing device herein
10 rotates, special provisions are necessary to prevent unintended torsion of the cable means which connect the weighing device to central control means. Since the weighing device is disposed fixedly in the apparatus according to the present invention, there is no question
15 of cables subject to torsion.

The structure according to the present invention is therefore simpler than that according to the above stated Netherlands patent application. The apparatus is suitable for metering liquid or pasty masses into relatively small
20 containers. The structure according to the invention prevents any vertical force being exerted by the drive means on the scales. Such a vertical force must be avoided since it would influence the measurement accuracy.

Driving takes place in the horizontal plane, wherein
25 the input and the output parts of the drive element lie mutually in line.

A specific embodiment of the apparatus according to the invention has the special feature that the drive comprises at least one drive cylinder of pneumatic,
30 hydraulic or electrical type.

A specific embodiment has the special feature that the drive comprises at least two cylinders connected mechanically in series to each other, the respective strokes of which correspond with respectively $1/2$, 14 ,
35 $1/8$, ... of the periphery of the drive drum. This embodiment enables rapid adjustment of the angular position of the second supporting means through respectively $\pm 180^\circ$, $\pm 90^\circ$, $\pm 45^\circ$, It will be apparent that any discrete angular position can hereby be realized, while the reso-

lution is determined by the cylinder with the smallest stroke.

The invention will now be elucidated with reference to the annexed drawings. Herein

5 figure 1 shows a partly broken away top view of an apparatus according to NL-1006685 such that a part of the interior is visible;

figure 2 shows a partly broken away front view of the apparatus;

10 figure 3 shows a partly broken away side view of the apparatus;

figure 4 shows the detail IV in figure 1 on enlarged scale;

15 figure 5 shows the top view according to figure 4 of the total arrangement of all dispensing nozzles;

figure 6 is a schematic representation of an embodiment with fixed orientation relative to the centre of the path;

20 figure 6A shows a cross-section through the central transmission device with slide contacts;

figure 6B shows a view corresponding with figure 6A of capacitive optical transmission;

figure 6C shows a schematic view corresponding with figure 6A of an inductive transmission;

25 figure 7 shows an embodiment with fixed orientation relative to a fixed point outside the circular path;

figure 8 is a schematic representation of an embodiment with invariable orientation making use of mechanical XY guide means;

30 figure 9 shows a variant with toothed wheels and a chain or toothed belt;

figure 10 shows a variant with toothed wheels;

figure 11a shows a highly schematic side view of an apparatus according to the invention;

35 figure 11b shows a highly schematic top view of the detail A-A in figure 11;

figure 12 is a partly transparent perspective view of another embodiment; and

40 figure 13 is a schematic side view of yet another embodiment.

Figures 1, 2 and 3 show an apparatus 1 for metering liquid or pasty masses to a receiving container 2; on top of the apparatus 1 containers for the masses can be placed in fixed positions on a support platform 3.

5 The apparatus further comprises a fixedly disposed frame 4 which bears a number of dispensing nozzles controllable by fixedly disposed central control means (not shown) such as a PC or PLC. These nozzles are ordered in a respective inner ring 5 and outer ring 6. Inner ring 5
10 comprises eleven dispensing nozzles, all designated with 7, while outer ring 6 comprises twenty-two dispensing nozzles 8. It is noted that each dispensing nozzle is connected to two conduits, i.e. a supply conduit and a
15 flows permanently through dispensing nozzles of this type so as not to incur any problems with fouling, caking and lump-forming in the case of prolonged standstill. The dispensing openings are shown particularly clearly in figures 4 and 5 as the central zones of the relatively
20 large annular structures.

The apparatus 1 further comprises second supporting means in the form of a rotatable support platform 9 which bears a weighing device 10. With this configuration receiving container 2 can proceed through a path such
25 that it can receive mass from any of the dispensing nozzles 7, 8 of both the inner ring 5 and the outer ring 6.

The weighing device is connected to a power source and the control means for receiving power supply and for
30 generating information to the control means. This connection is embodied such that the cable means required for this purpose are not subjected to any torsion in this embodiment, irrespective of the angular position of support platform 9. This important aspect of the inven-
35 tion will be further elucidated with reference to figure 6.

Support platform 9 is rotatable by means of a motor
12 with transmission means 13 connected thereto. Within the scope of the invention it is not important to discuss
40 the manner in which the control of the motor and optional

transmission means takes place such that receiving container 2 is always carried to the correct location and is held still there. Tacho means can for instance co-act with support platform 9.

5 Not considered at all is the manner in which dispensing nozzles 7, 8 are controlled. It is generally known that use can be made for this purpose of electrically, pneumatically or hydraulically controllable valves. This aspect does not however form part of the
10 invention.

Figure 6 shows the annular path 14 in which weighing device 10 can move as according to arrows 16. Owing to the fixed arrangement of weighing device 10 on support platform 9, it has a fixed orientation relative to the
15 centre 15 of the path 14. Designated symbolically are two cables 17, which connect weighing device 10 to respective split rings 18 and 19 via respective slide contacts 20 and 21.

Figure 6A shows the relevant configuration.

20 Figure 6B shows an alternative. In this embodiment there are two possibilities. A lower structure 22 and an upper structure 23 mutually co-act for the electrical transfer of energy and signals. In a practical embodiment the lower structure, which is fixedly disposed, comprises
25 an outer ring 24 and an inner ring 25, while the upper structure has rings co-acting therewith, i.e. an outer ring 26 and an inner ring 27. The upper structure is connected to support platform 9 and therefore rotatably movable. Rings 24, 25, 26, 27 can be pairs of capacitor
30 plates co-acting for capacitive transfer, particularly while making use of high frequencies. Use can also be made of light-emitting junctions or semiconductor diodes and light-sensitive receptors co-acting therewith. It is also possible to transfer energy as well as analog or
35 digital information with such structures.

Figure 6C shows a lower structure 28 and an upper structure 29 which comprise respective, mutually co-acting annular coils for inductive transfer of power supply, for instance with a frequency of 10 kHz and the
40 transfer in reverse direction of information, for in-

stance information with a frequency content considerably above said power supply frequency.

Figure 7 shows an embodiment wherein a symbolically designated arm 30 of variable length, for instance an arm consisting of telescopically co-acting parts, is connected non-rotatingly on one side to weighing device 10 and connected pivotally on the other side to a hinge 31. The structure shown in figure 7 ensures that the net rotation of weighing device 10 amounts to zero after covering a path of 360°.

Figure 8 shows a variant wherein via an arm 32 of variable length the weighing device 10 is movable with fixed orientation relative to a carriage 33, which is movable reciprocally as according to arrow 35 along a straight guide 34. With this configuration, as shown in figure 8, the orientation of weighing device 10 is kept invariable and independent of the position on the path 14 of weighing device 10.

Figures 9 and 10 show variants which realize the same effect with other means.

In the embodiment according to figure 9, weighing device 10 is supported by a toothed wheel 35 which is rotatable relative to path 14 and which co-acts via a toothed belt or chain 36 with a fixedly disposed central toothed wheel 37. Toothed wheels 35 and 37 are identical. The orientation of weighing device 10 is thus kept invariable over the whole path 14.

The configuration of figure 10 differs from the configuration of figure 9 insofar as toothed wheels 35 and 37 are not mutually coupled with a toothed belt or chain 36 but via a third toothed wheel 38 which is disposed such that the centres of toothed wheels 35, 38, 37 always lie on a collective radial straight line. Figure 10 shows symbolically that the dimensions of toothed wheel 38 are irrelevant. Of essential importance however is that toothed wheels 37 and 35 are identical.

It is noted that transmission means other than those according to figures 9 and 10 are also possible so as to ensure that the orientation of weighing device 10 is invariable.

Figures 1-10 all relate to the apparatus according to NL-1006685. Figures 11a and 11b relate to the structure according to the present invention. Reference is made to figures 1, 2, 3, 4 and 5 for elucidation of the deployment of the dispensing nozzles.

Figure 11a shows an apparatus 51a according to the invention. At variance with the embodiments of figures 1-10, the weighing device is disposed fixedly in apparatus 51a. It supports a platform 52 which is rotatably drivable via a vertical rotation axis 53. For this purpose platform 52 is rigidly coupled to a drive drum 54. This is mounted for rotation round axis 53, for instance by a central pin, optionally in combination with further bearings.

As shown in figure 11b, a tensioned cord 55 is trained round drum 54 such that the one part 56 and the other part 57 of element 55 lie precisely in line with each other. Tensile forces can be exerted in both directions on drive element 55 by drive means to be described hereinbelow. These forces are indicated with arrows 58. Cord 55 is of the endless type and, as is drawn in the embodiment of figure 11a, is guided in an endless path by four deflecting rollers 59, 60, 61, 62. Driving takes place via three cylinders 63, 64, 65 respectively. These have respectively a stroke of $1/2$, $1/4$ and $1/8$ of the periphery of the drive drum 54. Since the cylinders are mutually connected in series and individually controllable via control means (not shown), platform 52 can be placed by suitable control of cylinders 63, 64, 65 in any discrete angular position with mutual distances of 45° .

Figure 12 shows a weighing device 10 with a weighing platform 72 supported rotatably by central shaft 71. Weighing platform 72 bears on its periphery a toothing 73 and thus has the character of a toothed wheel. Co-acting with this toothed wheel 72 is a drive toothed wheel 74 which can be driven by a motor 75, for instance a stepping motor, which is disposed fixedly relative to weighing device 10. When a weighing is performed, wherein one or more containers are placed on support platform 72, the driving co-action between toothed wheels 74 and 72 must

be prevented from having any effect on the weighing. Toothed wheel or support platform 72 must be substantially freely movable in vertical direction in order to carry out weighing. Drive toothed wheel 74 could have a disruptive influence here. In this respect the metering device is embodied in the embodiment according to figure 12 such that during performing of a weighing the drive 74, 75 is inactive and toothed wheels 72, 74 are mutually disengaged. In this way no force which may influence the weighing can be exerted on support platform 72. Attention is drawn to the fact that with a view to a complete disengagement the teeth 73 of support platform 72 and the teeth 76 of toothed wheel 74 fit together with a slight gap. Hereby achieved in addition to driving operation of motor 75 is that the freely rotatable support platform 72 can be moved freely up and downward during a weighing.

The problem described occurs in the case of figure 12 when the motor and the weighing device 10 are fixedly disposed relative to each other.

Figure 13 shows another solution in this respect. In the configuration of figure 13 weighing device 10 bears a weighing platform 72 deployed solely for vertical displacement. This weighing platform 72 supports a directly driven motor 82 which, via a drive shaft 83, supports a rotatable support platform 84 on which containers 2 can be placed. In the embodiment according to figure 13 weighing platform 81 also supports the motor 82 which provides the rotation of support platform 84. The signal processing means which process the signals generated by weighing device 10 must be embodied such that a correction can take place for the presence of a motor 82 which is also weighed by weighing device 10. As is usual during a weighing, the scales inclusive of the supporting means are set to a zero value, which zero value in the case of figure 13 also takes account of the weight of the motor.

In figures 11, 12 and 13 an arrow 91 indicates the rotation of the respective support platforms.

It is noted that the variant according to figure 13, wherein motor 82 is supported by weighing platform 81, can also drive support platform 84 in the manner shown in

figure 12, therefore not directly but via a toothed gearing. In this case the toothed gearing does not then have to be embodied such that during weighing the toothed wheels are mutually disengaged. Because weighing platform 5 81 supports both the motor and the support platform, both move up and downward together, so that there is no need to fear a force being exerted on the support platform by the motor such that the measurement could thereby be influenced.

CLAIMS

1. Apparatus for metering a plurality of different liquid or pasty masses such as paint, ink, thickening or thinning agents and the like to a receiving container, for instance a bucket or a can, which apparatus comprises:

first supporting means for supporting containers for the masses in fixed positions;

a fixedly disposed annular frame bearing a number of dispensing nozzles controllable by fixedly disposed central control means (PLC, PC) and each individually connectable to said containers via respective conduits;

second supporting means controllable by said control means for supporting a receiving container such that this receiving container is displaceable in an annular path corresponding with the annular form of the frame and can be placed temporarily beneath a chosen dispensing nozzle for receiving mass dispensed by this dispensing nozzle;

a weighing device on which a receiving container can be placed, which weighing device can supply signals to the control means which are representative for the weight of the receiving container with its content or the change in that weight;

which control means are adjustable, for instance by means of program control, for dispensing different masses in determined quantities to successive receiving containers, for instance in successive cycles, in order to make successive mixtures of respective chosen compositions;

wherein the weighing device is disposed fixedly, is connected to the control means via cable means and supports the second supporting means, and

wherein the second supporting means are rotatably drivable round a vertical axis by means of a drive device co-acting with the second supporting means such that when a weighing is performed the drive is inactive such that no forces which can influence the weighing are exerted on these second supporting means, for instance the drive is

substantially disengaged from the second supporting means.

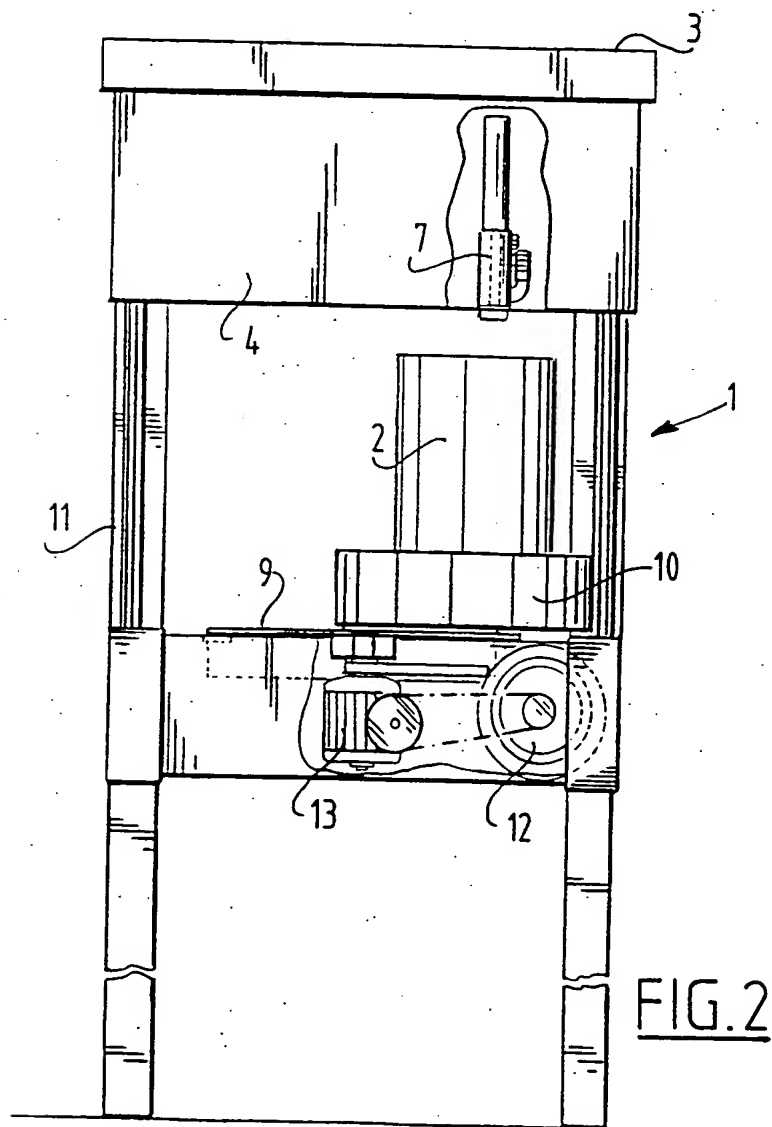
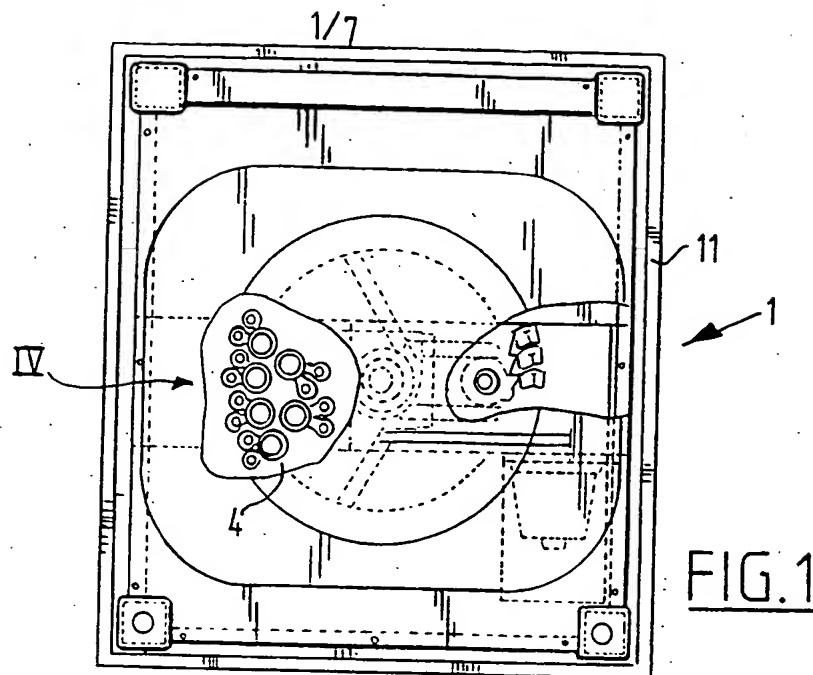
2. Apparatus as claimed in claim 1, wherein the second supporting means comprise a round gear rim and a toothed wheel co-acting therewith and drivable by a
5 fixedly disposed drive is present, the teeth of which gear rim and of which toothed wheel fit together with a slight gap.

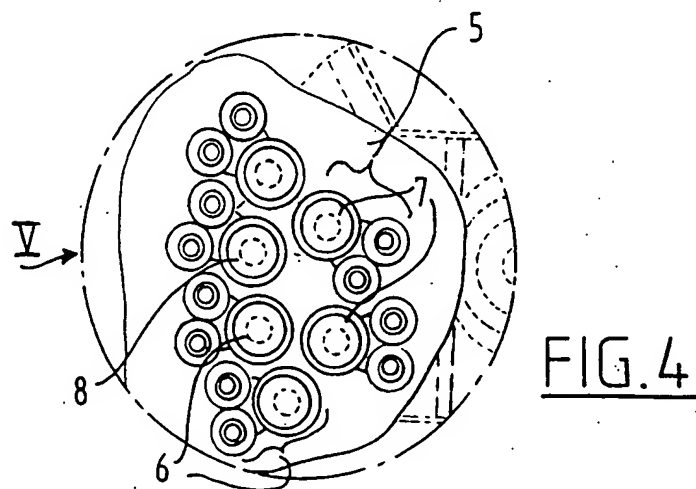
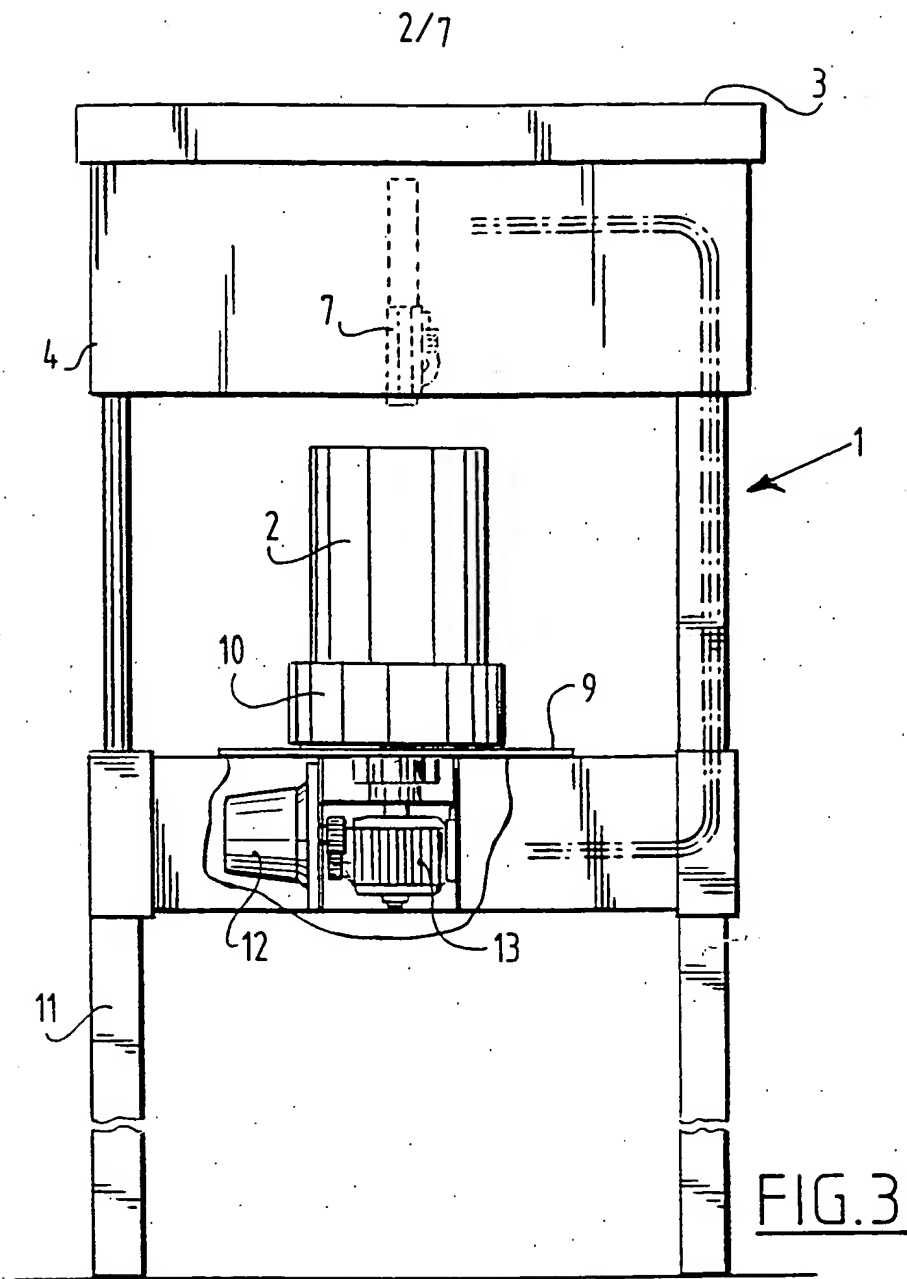
3. Apparatus as claimed in claim 1, wherein the
10 second supporting means also support the drive, for instance comprise a round gear rim, and a toothed wheel co-acting therewith and drivable by a drive is present, which drives and which toothed wheel are supported by the second supporting means.

15 4. Apparatus as claimed in claim 1, comprising a cylindrical drive drum around which an elongate, optionally endless drive element, such as a belt, toothed belt, cord or cable is trained through a whole number of rotations, which drive element is drivable by a drive and
20 held under a certain tensile stress.

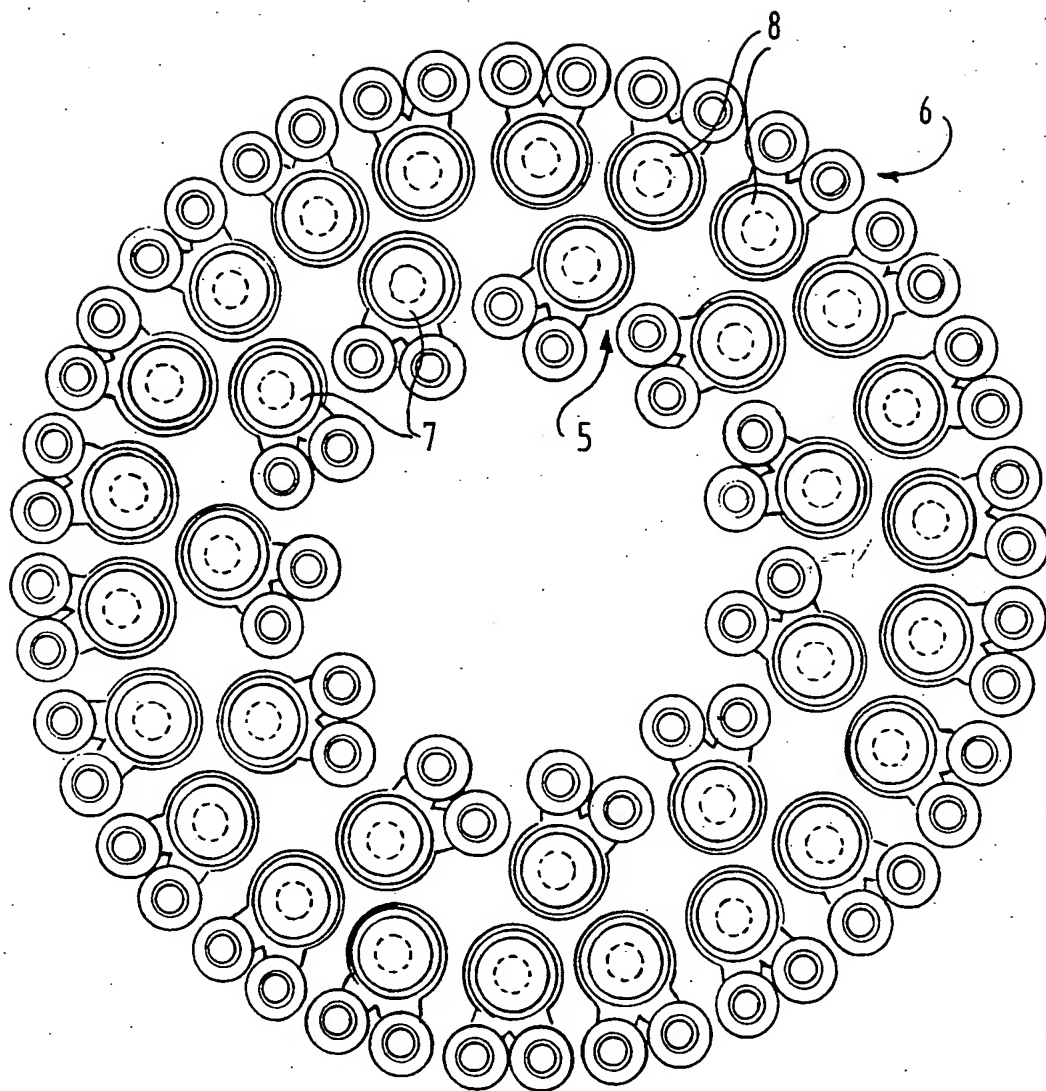
5. Apparatus as claimed in claim 1, wherein the drive comprises at least one drive cylinder of pneumatic, hydraulic or electrical type.

6. Apparatus as claimed in claim 5, wherein the
25 drive comprises at least two cylinders connected mechanically in series to each other, the respective strokes of which correspond with respectively $1/2$, $1/4$, $1/8$, ... of the periphery of the drive drum.





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FIG. 5

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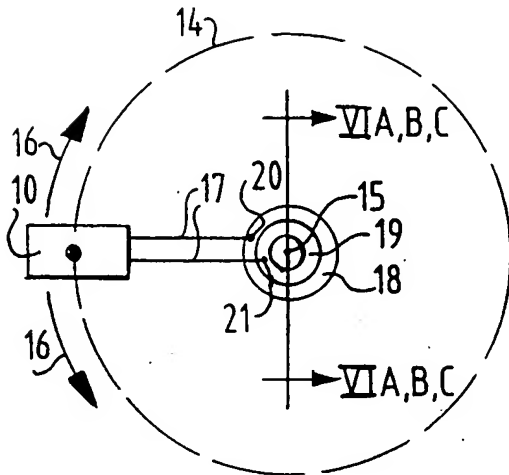


FIG. 6

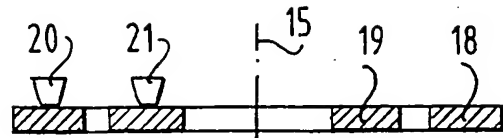


FIG. 6A

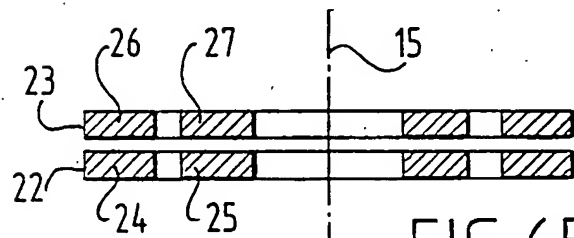


FIG. 6B

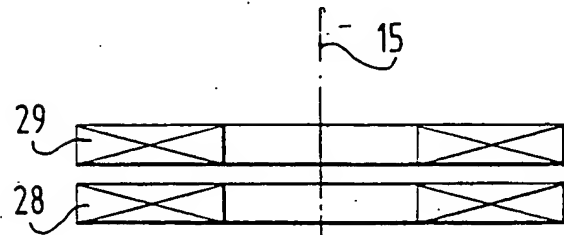


FIG. 6C

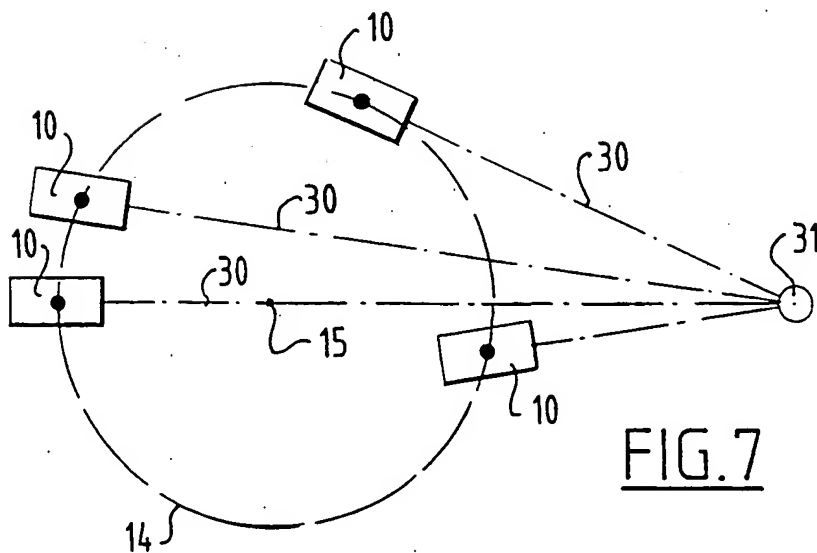
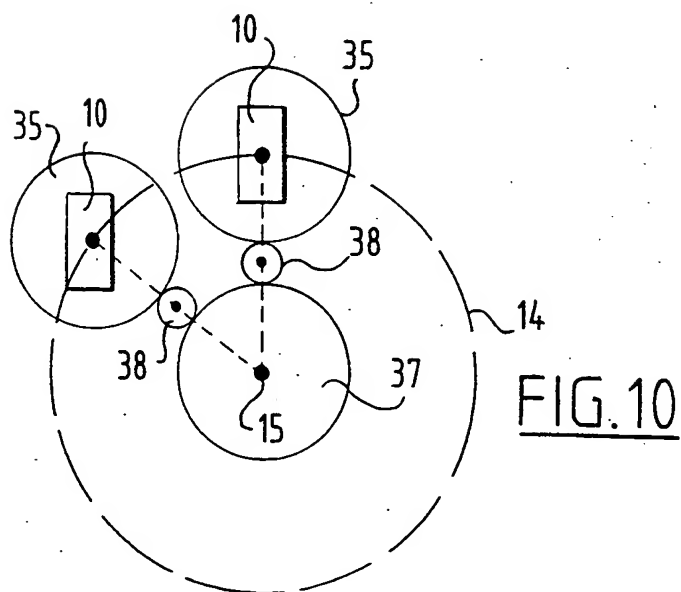
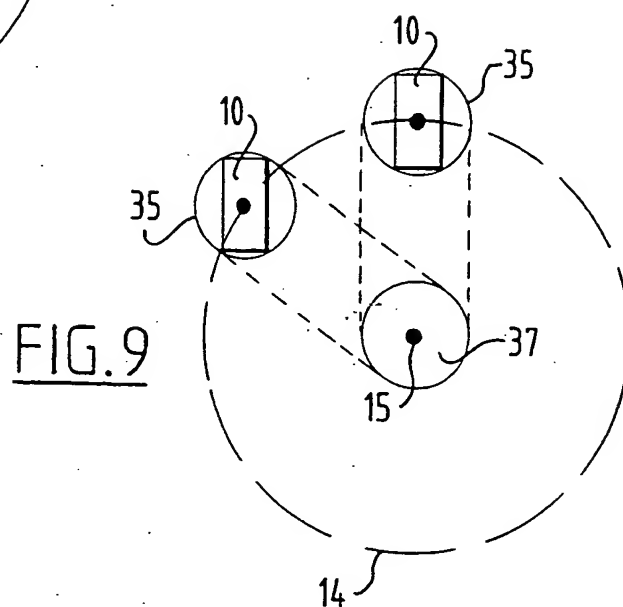
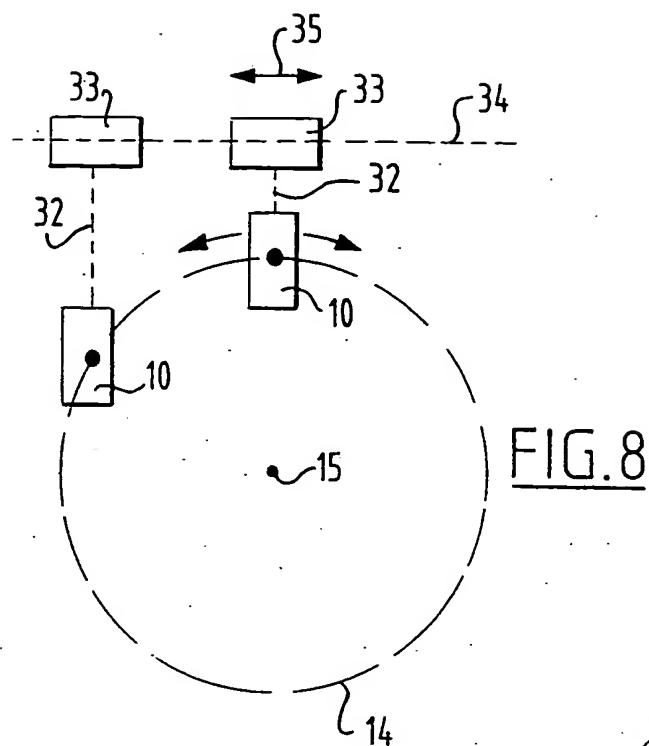


FIG. 7

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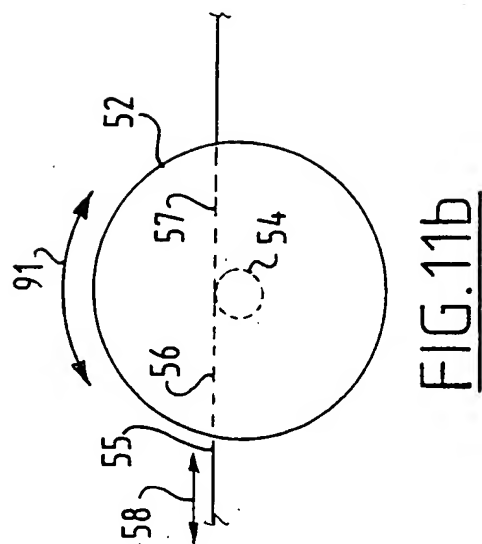
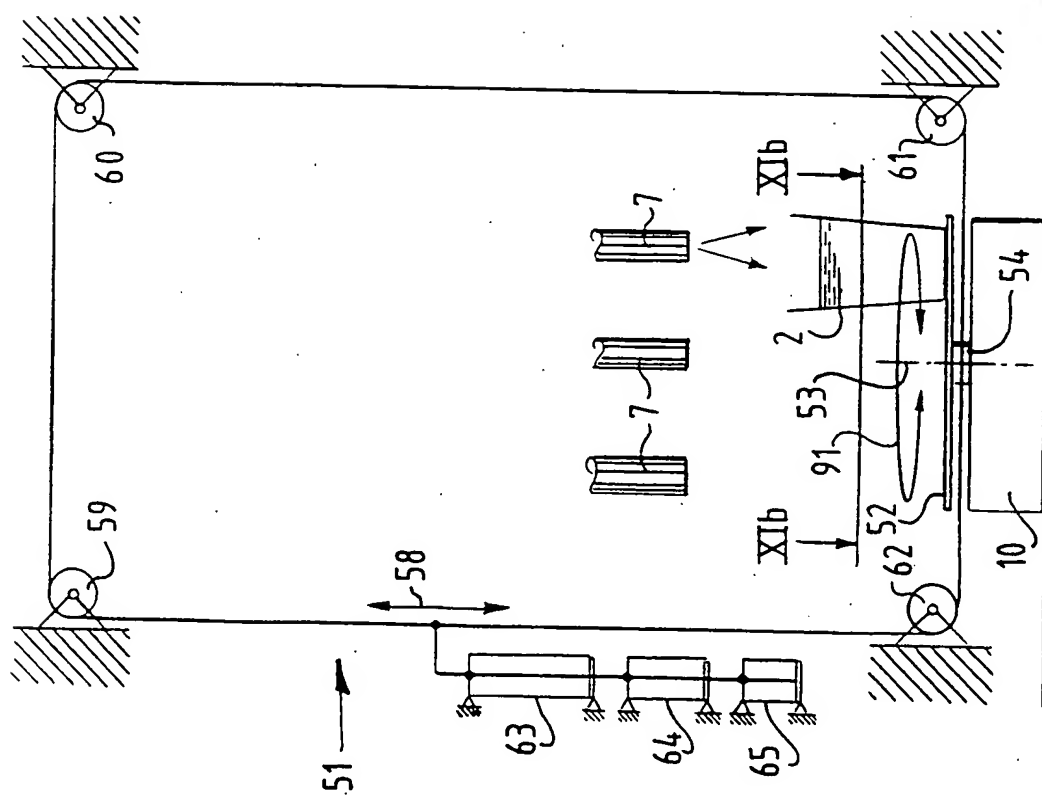
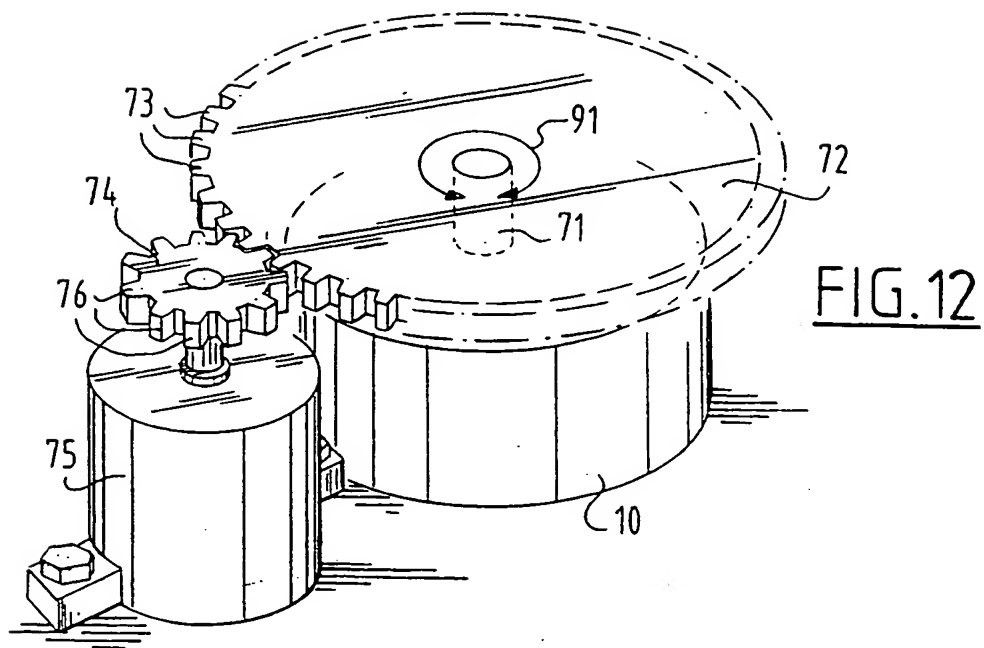
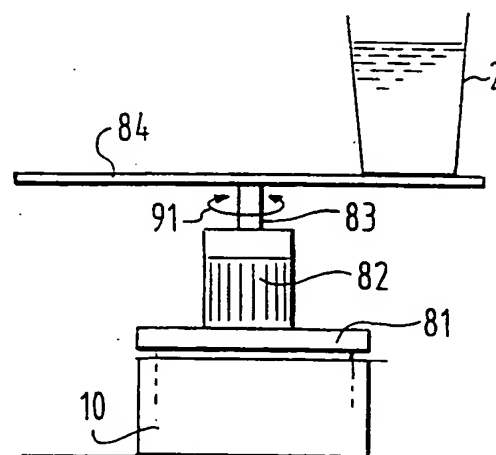


FIG. 11b

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FIG. 13

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 98/00497

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B44D3/06 B65B3/28 B01F13/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B44D B65B B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 526 215 A (W. J. HARRISON ET AL) 2 July 1985 see column 7, line 8 - column 12, line 18. ---	1,4
X	EP 0 654 298 A (I.A.S. INDUSTRIAL AUTOMATION SYSTEMS S.A.S. DI GINO GALLI & C.) 24 May 1995 see column 4, line 51 - column 9, line 31 ---	1,4,5
X	WO 96 26889 A (T. RANDSBORG ET AL) 6 September 1996 see page 5, line 5 - page 16, line 32 ---	1,4
A	EP 0 693 310 A (DUNN-EDWARDS CORPORATION ET AL) 24 January 1996 see column 6, line 41 - column 26, line 59 --- -/--	1

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search

25 November 1998

Date of mailing of the international search report

29/12/1998

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 98/00497

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4 585 148 A (YOSHITO ITO) 29 April 1986 see column 5, line 1 - column 7, line 68 ---	1
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Information on patent family members

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